

Cherokee Nation Community Air Toxics Project

- Presented by Cherokee Nation Environmental Programs – Clean Air Program, Tahlequah, OK



CNEP Clean Air Program – Current Sites

- PM2.5 sites - 5
- PM10 sites - 1
- Criteria Pollutant Sites – 5
- Mobile monitoring station



Current location of mobile monitor - Mescalero Apache tribal lands, Otero county, NM

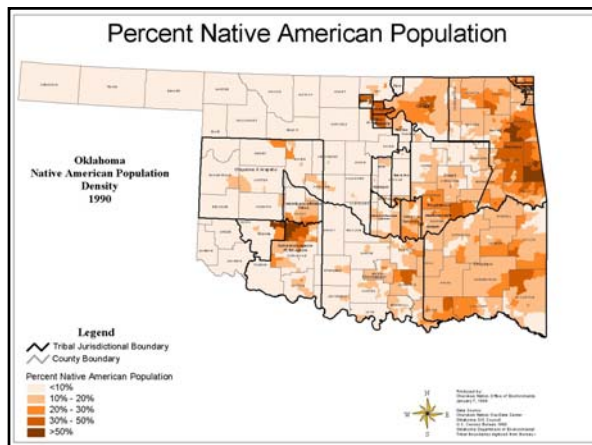
The CNEP Clean Air Program participates in national monitoring programs, such as:

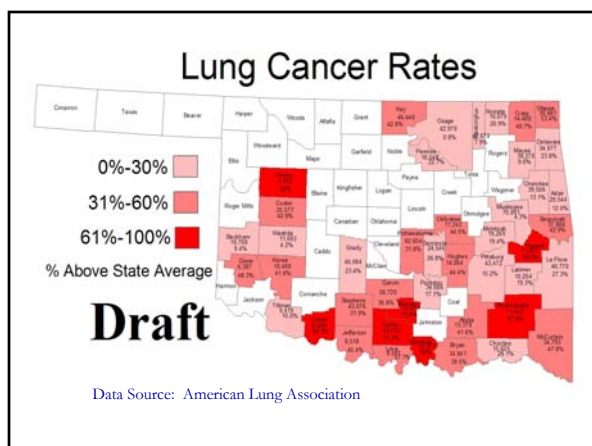
- IMPROVE – Inter-Agency Monitoring of Protected Visual Environments
- CASTNet – Clean Air Status and Trends Network
- Mercury Deposition Network – MDN (OK15 & OK99)
- National Trends Network – NTN (OK99)

The Clean Air Program also participates in various special projects, such as:

- ❑ Southern Ontario Ammonia Passive Sampler Survey (SOAPSS)
- ❑ Four Corners and Oklahoma Passive Ammonia Monitoring Project – EPA Region 6
- ❑ VOC screening project – Cherokee Heights (2005)

The findings of the screening project revealed a potential problem, which led to the current 18-month VOC sampling project.





What factors are contributing to high respiratory cancer rate in Mayes County?

- Smoking?
- Industrial air emissions?
- Occupational exposure?
- Other exposures?
- Synergistic effects?

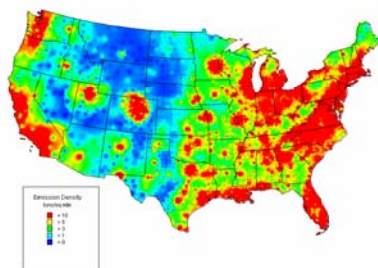
Lung, Trachea, Bronchus, & Pleura Cancer Mortality Rates (highest 6 counties in Oklahoma)

- | | |
|----------------------|--------|
| 1. Ottawa County | 38.5%* |
| 2. Mayes County | 32% |
| 3. Pushmataha County | 25% |
| 4. Tulsa County | 24.9% |
| 5. LeFlore County | 24.4% |
| 6. Muskogee County | 22.7% |

*Percent higher than US average

Source: National Cancer Institute

Figure 2-11. Density Map of 1998 VOLATILE ORGANIC COMPOUND Emissions by County

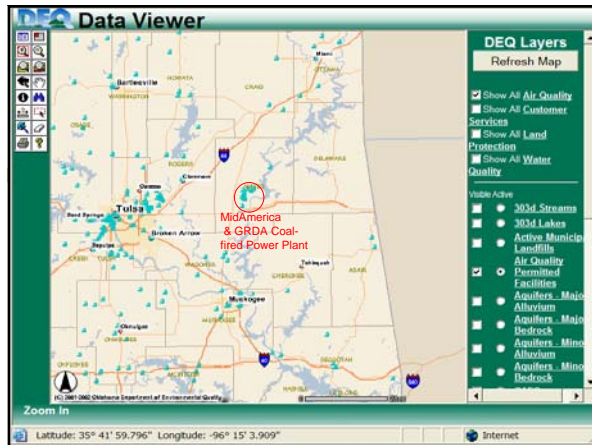


Toxic Air Releases by Oklahoma County (Rogers, Muskogee and Mayes Release 26.6% of State Total)

	Pounds
Rogers	4,569,489 (2285 Tons)
McCurtain	3,574,502
Choctaw	3,392,000
Oklahoma	2,131,064
Garfield	1,827,637
Tulsa	1,338,985
Osage	993,374
Muskogee	920,255 (460 Tons)
Mayes	708,194 (354 Tons)

Note: Above counties represent the highest reported toxic air releases in Oklahoma

Source: 1998 Oklahoma Toxics Release Inventory Summary Report, Oklahoma DEQ



Coal-Fired Power Plant & MidAmerica Industrial Park



This 9000-acre industrial park is home to over 70 firms, and is located 40 miles east of Tulsa.

Cherokee Heights Tribal Housing Near Pryor, Oklahoma



113 homes with approximately 275 residents (approximately 175 are children). Cherokee Heights is less than one mile from some sections of the industrial park.

Pryor monitoring site, located next to Cherokee Heights community



Screening Project Methodology, Winter of 2004-2005


- ❑ Ambient air samples collected and analyzed in accordance with EPA Test Method TO-15
- ❑ Samples collected in 6L vacuum canisters
- ❑ Samples analyzed for 59 VOCs via GC/MS
- ❑ Sampling Period – 12/23/04 to 3/29/05
- ❑ Sampling Interval – 1 in 6 days
- ❑ Each sample was 24-hour time-weighted average sample
- ❑ 15 samples collected (no duplicates)

Results of Screening Project, Winter of 2004-2005

- ❑ 24 of 59 VOCs detected in one or more samples
- ❑ 15 of 24 detected VOCs are HAPs
- ❑ 5 detected VOCs (HAPs) exceeded an EPA chronic inhalation benchmark or an EPA screening level in one or more samples
 - m,p-Xylene
 - Methylene Chloride
 - Benzene (exceeded Oklahoma DEQ MAAC in one sample)
 - MTBE
 - TCE


Results

- ❑ 4 of the 5 VOCs exceeding an EPA chronic inhalation benchmark or an EPA screening level are respiratory carcinogens (methylene chloride, benzene, MTBE, TCE)
- ❑ Comparing sample data with wind rose data for each sample date supported hypothesis that detected VOCs may originate from nearby sources (power plants, MidAmerica Industrial Park, etc.)




Cherokee Nation Community Air Toxics Project

- Project Goals
 - Identify toxic air pollutants and their concentrations in ambient air at Cherokee Heights tribal community near Pryor, Oklahoma
 - Estimate risk posed to residents of Cherokee Heights by toxic air pollutants



Cherokee Nation Community Air Toxics Project - Methodology

- 92 VOC Canister samples (and 10 duplicate samples) will be collected via EPA Method TO-15 from September 2006 through March 2008
- Samples collected on EPA's 1-in-6 day schedule for ambient particulate monitoring
- Duplicate sample dates chosen via random number table
- Project data will be entered in AQS



Initial Results of Community Air Toxics Project Sampling

- 43 valid samples collected from 9/26/06 to 5/30/07
- ERG analyzed each sample for 60 VOCs
- Number of VOCs detected in each sample ranged from 14 (Jan. 30) to 30 (Oct. 10 and Nov. 19)

Concentrations of detected VOCs are compared to the following benchmarks:

- EPA Region 6 Human Health Medium Specific Screening Levels
 - Chronic inhalation toxicity values (non-cancer and cancer values)
 - Region 6 screening values for ambient air
- ODEQ Maximum Acceptable Ambient Concentrations (MAACs)
- ATSDR Minimal Risk Levels (MRLs) for inhalation

Initial Results of Community Air Toxics Project Sampling

- 3 to 7 detected VOCs equaled or exceeded EPA, ODEQ and/or ATSDR benchmarks in one or more samples

Initial Results of Community Air Toxics Project Sampling

VOC	Number of samples in which benchmark exceeded (43 total samples)	Concentration range of VOC in samples in which benchmark was exceeded (µg/m ³)
Acrolein	41	0.39 – 4.3
Chloromethane	17	1.1 – 1.53
1,3-Butadiene	11	0.04 – 0.08
Chloroform	14	0.09 – 0.10

Initial Results of Community Air Toxics Project Sampling

VOC	Number of samples in which benchmark exceeded (43 total samples)	Concentration range of VOC in samples in which benchmark was exceeded (µg/m ³)
Benzene	43	0.21– 1.09
Carbon Tetrachloride	43	0.50 – 1.01
Trichloroethylene (TCE)	9	0.05 – 0.54
1,2-Dichloroethane	1	0.12

Data Analyses

- Chloromethane, chloroform,, and 1,2-dichloroethane exceeded only screening levels
- Benzene, carbon tetrachloride and trichloroethylene exceeded both screening levels and cancer benchmarks
- 1,3-Butadiene exceeded a cancer benchmark

Data Analyses (continued)

- Acrolein exceeded both screening levels and a non-cancer benchmark
- In addition, acrolein was the only VOC to exceed both the ODEQ MAAC and the ATSDR MRL

Sources:
http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screenvalues.xls
<http://www.atsdr.cdc.gov/mrls/index.html#bookmark02>
<http://www.deq.state.ok.us/rules/100.pdf>

Data Analyses (continued)


- Relative percent difference for most VOCs detected in the duplicate samples collected on Oct. 2, Nov. 7, and Jan. 12 and April 30 were good (within 20%)
- The benzene/toluene ratios in the sample from May 18th was 0.35, which is characteristic of vehicular emissions. The ratios of the other 42 samples was 0.35 to 1.79, which is NOT characteristic of vehicular (gasoline engine) emissions.

Data Analyses (continued)

- Winds on sample days ranged from NE to S to NW (never from N) at 1 to 16 mph
 - Sources upwind of Cherokee Heights on these days included Locust Grove, highway 412, and Mid-America Industrial Park
- There was little of no rainfall on thirty-three of the thirty-nine valid sample dates

Comparison of 2006 VOC Data for Tulsa and Cherokee Heights

- ODEQ monitors 12 VOCs in Tulsa
- Concentrations of 7 of these 12 VOCs are higher in Tulsa than at Cherokee Heights
 - [mean] methylene chloride in Tulsa exceeds [range] of that VOC in Cherokee Heights by one order of magnitude
- Concentrations of remaining 5 VOCs are generally same in Tulsa and in Cherokee Heights
- Benzene/Toluene ratios: Tulsa (0.14-0.35); Cherokee Heights (0.58-1.79)



Future Monitoring and Risk Assessment

- CN hopes to expand air toxics sampling at its Pryor site to include metals and continuous VOC monitoring
- Data from current and future air toxics monitoring projects at Cherokee Heights will be used in a human health risk assessment
